

Claims

- [c1] 1. An optical substrate comprising:
a surface comprising a prism structure characterized by a cross section having a curved facet described by the equation
- $$z = \frac{cr^2}{1 + \sqrt{1 - (1+k)c^2r^2}} + dr^2 + er^4 + fr^6,$$
- wherein z is the perpendicular deviation of the surface of the facet of the prism from a straight line originating at a first reference point at a base of the prism and terminating at a second reference point near the peak of the prism and the coefficients of the polynomial lie within the following approximate ranges: $-20 < c < 20$; $-10 < d < 10$; $-10 < e < 10$; $-10 < f < 10$ and $-1 < k$ is less than or equal to zero and where r is a radial coordinate or distance from an optical axis.
- [c2] 2. The optical substrate as set forth in Claim 1 wherein the prism structure comprises a plurality of prisms having a prescribed peak angle, α , a height, h , a length, l , and a pitch, p .
- [c3] 3. The optical substrate as set forth in Claim 2 wherein the plurality of prisms include at least a pseudorandom peak angle, α , height, h , length, l , and pitch, p .
- [c4] 4. The optical substrate as set forth in Claim 1 wherein a peak angle of the prism is greater than 90 degrees and the refractive index of the substrate is between approximately 1.65 and 1.8.
- [c5] 5. The optical substrate as set forth in Claim 4 wherein the peak angle is 100 degrees.
- [c6] 6. An optical substrate comprising:
a surface comprising a prism structure characterized by a peak angle of greater than 90 degrees and a refractive index of between approximately 1.65 and 1.8.
- [c7] 7. The optical substrate as set forth in Claim 6 wherein the peak angle is 100 degrees.
- [c8] 8. A backlight display device comprising:

an optical source for generating light;
 a light guide for guiding the light therealong including a reflective device
 positioned along the light guide for reflecting the light out of the light guide;
 an optical substrate receptive of the light from the reflective device, the optical
 substrate comprising:
 a surface comprising a prism structure characterized by a cross section having a
 curved facet.

[c9] 9.The backlight display device as set forth in Claim 8 wherein the curved facet is
 described by a segment of a polynomial function.

[c10] 10.The backlight display device as set forth in Claim 8 wherein the segment of
 the polynomial function is described by the equation

$$z = \frac{cr^2}{1 + \sqrt{1 - (1+k)c^2r^2}} + dr^2 + er^4 + fr^6,$$

wherein z is the perpendicular deviation of the surface of the facet of the prism
 from a straight line originating at a first reference point at a base of the prism
 and terminating at a second reference point near the peak of the prism and the
 coefficients of the polynomial lie within the following approximate ranges: -20
 $< c < 20$; $-10 < d < 10$; $-10 < e < 10$; $-10 < f < 10$ and $-1 < k$ is less than or
 equal to zero and where r is a radial coordinate or distance from an optical axis.

[c11] 11.The backlight display device as set forth in Claim 8 wherein a peak angle of
 the prism is greater than 90 degrees and the refractive index of the substrate is
 between approximately 1.65 and 1.8.

[c12] 12.The backlight display device as set forth in Claim 11 wherein the peak angle
 is 100 degrees.

[c13] 13.The backlight display device as set forth in Claim 8 wherein the optical
 substrate is formed with an optically transparent material with an index of
 refraction between approximately 1.65 and 1.8.

[c14] 14.The backlight display device as set forth in Claim 10 wherein the optical
 substrate is formed with an optically transparent material with an index of
 refraction of approximately 1.75.

- [c15] 15. An optical substrate comprising:
a surface comprising a prism structure characterized by a cross section having a plurality of facets including a first facet oriented at a first angle with respect to the surface of the prism and a second facet oriented at a second angle with respect to the surface of the prism;
wherein the first and second facets intersect at one side of a centerline of the prism and the first and second angles are different.
- [c16] 16. The optical substrate as set forth in Claim 15 wherein a peak angle of the prism structure is greater than 90 degrees and the refractive index of the substrate is between approximately 1.65 and 1.8.
- [c17] 17. The optical substrate as set forth in Claim 16 wherein the peak angle is 100 degrees.
- [c18] 18. The optical substrate as set forth in Claim 1 wherein the prism structure is an ultraviolet curable organic or inorganic material.
- [c19] 19. The optical substrate as set forth in Claim 6 wherein the prism structure is an ultraviolet curable organic or inorganic material.
- [c20] 20. The backlight display device as set forth in Claim 8 wherein the prism structure is an ultraviolet curable organic or inorganic material.
- [c21] 21. The optical substrate as set forth in Claim 15 wherein the prism structure is an ultraviolet curable organic or inorganic material.
- [c22] 22. The optical substrate as set forth in Claim 1 wherein the prism structure includes a peak angle of greater than approximately 94 degrees and wherein c, d, e, f, and k are approximately equal to zero.
- [c23] 23. The optical substrate as set forth in Claim 1 wherein the equation for z includes higher order terms in r defined by the summation

$$\sum_{i=1}^N a_i r^i$$
where a_i are coefficients and N is an integer.
- [c24] 24. The optical substrate as set forth in Claim 10 wherein the prism structure

includes a peak angle of greater than approximately 94 degrees and wherein c, d, e, f, and k are approximately equal to zero.

- [c25] 25.The optical substrate as set forth in Claim 10 wherein the equation for z includes higher order terms in r defined by the summation

$$\sum_{i=1}^N a_i r^i$$

where a_i are coefficients and N is an integer.

- [c26] 26.An optical substrate comprising:
a surface comprising a prism structure characterized by a cross section having a facet described by the equation

$$z = \frac{cr^2}{1 + \sqrt{1 - (1+k)c^2 r^2}},$$

wherein z is the perpendicular deviation of the surface of the facet of the prism from a straight line originating at a first reference point at a base of the prism and terminating at a second reference point near the peak of the prism.

- [c27] 27.The optical substrate as set forth in Claim 26 wherein the equation further comprises thea summation of higher order terms

$$+ dr^2 + er^4 + fr^6$$

wherein the coefficients thereof lie within the following approximate ranges: $-20 < c < 20$; $-10 < d < 10$; $-10 < e < 10$; $-10 < f < 10$ and $-1 < k$ is less than or equal to zero and where r is a radial coordinate or distance from an optical axis.

- [c28] 28.An optical substrate comprising:
a surface comprising a prism structure characterized by a cross section having a plurality of facets intersecting at a peak so as to subtend a peak angle of α .

- [c29] 29.The optical substrate as set forth in Claim 28 wherein the plurality of facets form one or more compound facets respectively subtending an angle of β or θ with a base of the prism.